Assessment of New Zealand's Forest Codes of Practice for Erosion and Sediment Control

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Bachelor of Forestry Science with Honours

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Abstract

New Zealand's forest industry operates under several codes of practice for erosion and sediment control. Inconsistency between regional forestry regulations led industry to lobby for the Proposed National Environmental Standard for Plantation Forestry (PNESPF). A national code of practice may also need to be introduced to give effect to the PNESPF. This dissertation focuses on what type of code of practice should be adopted, and under what conditions.

The conditions required for a code of practice to succeed in protecting the environment were identified. The 'external' social and legal conditions were identified through analysis of three case studies from the international primary sector, whilst the 'internal' conditions relating to the development, content and implementation of a code of practice were identified through review of literature. These ideal internal conditions formed the basis of the criteria used to assess New Zealand's codes.

Six of New Zealand's forest codes of practice were classified by their type, the motivation for a corporation to comply with them, and enforcing agency. The internal conditions of these codes were then assessed to determine the strengths and weaknesses of the existing documents. Overall, the codes had well-defined objectives, good planning information and clear communication. The weaknesses included regulatory approach, comprehensiveness, foundation (particularly stakeholder involvement), monitoring information and review process.

The proposed national code of practice, if introduced, should be a prescriptive code. A prescriptive code is better than an outcome-based code because it is difficult to prove liability for sedimentation and erosion. Compliance with a prescriptive code should be like liability insurance, so that if a corporation is fully compliant with a prescriptive code of practice, it should not be held liable for adverse environmental impacts. This is a preliminary recommendation only, as the external conditions operating in New Zealand still need to be investigated.

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1 Introduction

The district and regional plans which are used by local government to implement the Resource Management Act 1991 (RMA) have inconsistent rules for forestry in different geographical areas. These rules seemingly constantly change, causing insecurity and reducing industry efficiency (Fowler & Pedley, 2012). To remedy this issue the Proposed National Environmental Standard for Plantation Forestry (PNESPF) was introduced in 2010, with the purpose of providing a consistent set of rules for forestry operations nationwide (Fowler & Pedley, 2012).

As part of the PNESPF development process, the Ministry for the Environment commissioned staff from the University of Canterbury's Schools of Forestry and Geological Sciences to analyse erosion risks for New Zealand plantation forestry. The resultant report identified the need for a national code of forest engineering practice for New Zealand's plantation forestry industry (Bloomberg, Davies, Visser, & Morgenroth, 2011). At present, there are a number of codes and guidelines available in New Zealand. These are published by organisations such as the New Zealand Forest Owner's Association (NZFOA), regulatory authorities such as Regional and District Councils, and individual forestry corporations.

1.1 Research Objectives

The objective of this dissertation is to explore the concept of codes of practice and their use in New Zealand forestry, with particular focus on erosion and sediment control. By exploring this concept, this dissertation will facilitate understanding of what codes of practice are, what forms they may take and what makes them successful or unsuccessful. Using this understanding, this dissertation aims to establish what form a national forest code of practice should take, if it were to be introduced under the PNESPF.

2 Literature Review

The purpose of this literature review is to provide background information on the topic of codes of practice in the primary production sector, with a particular focus on forestry, and to identify any gaps in the research to date.

The first section of the review will focus on the potential adverse environmental effects of forestry earthworks operations, with some examples of forestry corporations' non-compliance with existing codes of practice.

The second section of the review will focus on what a code of practice is and how codes can be implemented, as well as options to consider when writing and enforcing a code.

2.1 Environmental Effects of Forestry Earthworks Operations

The reason that forestry earthworks operations are governed by codes of practice is because poorly managed operations have the potential to cause adverse environmental effects. According to the NZFOA (2007), earthworks operations can increase soil exposure and destabilisation, causing accelerated erosion. Further, they can also cause excessive levels of sediment discharge into waterways. Sediment in the waterways decreases water quality (Figure 1), and so can have an effect on waterway ecology, landscape, and community and cultural values (NZFOA, 2007).

Figure 1: Sediment discharge into water, and resultant sedimentation

Another potential impact of poorly managed operations is the deposition of forest debris in waterways and downstream areas. Logging debris or “slash” (such as waste wood and branches) slides downhill as the soil erodes, moving from the harvested area or “cutover” into the gullies and waterways below. This can also be caused by landing failure. Landing failure can occur when the landing is overloaded with slash and the structural integrity of the landing is compromised by erosion. The piles of slash, or “bird nests”, on the landing then slide downslope onto the cutover. Once the debris enters a waterway, it continues downstream until an obstacle causes the debris to back up. This is often where damage is first noticed, as the debris backs up against bridges, culverts or farm fences. Otherwise, the debris can be deposited in streams (Figure 2) and on floodplains, in paddocks, or on beaches (Douglas, Stokes, & Wairoa Soil Conservation Ltd, 2011).

Figure 2: A debris dam, created when slash from the cutover moved into the gully

The effects of erosion events, allegedly caused or exacerbated by forestry operations, have featured in the media a number of times in recent years. High-intensity rainfall events around New Zealand which caused sediment and logging debris to wash downstream, damaging property (Figure 3) and infrastructure, have brought this issue

into the limelight. Recent events include a "log avalanche" at Tapawera in May 2010[1] and flooding in the Nelson region in December 2011[2].

Figure 3: Debris on downstream properties after the Tapawera flood, May 2010 Source: http://www.stuff.co.nz/nelson-mail/news/3705485/Log-avalanche-as-flood-hits

Under the RMA, causing adverse environmental effects can leave the perpetrator liable for prosecution for breaching their resource consent conditions. In March 2010, one of New Zealand's major forest management corporations, PF Olsen Limited, was fined $80,000 for breaching the RMA. During a "one in twenty year" rainfall event, several piles of logging debris collapsed, releasing sediment and logging debris into waterways. Environment Bay of Plenty stated that they "hoped the prosecution and subsequent fines will act as a deterrent to other companies"[3].

The Northland District Council have reported that when resource consents are issued for forestry, the level of compliance with codes of practice is generally high. However, non-compliance with codes of practice is more common when the activity is classed as 'permitted'. This is apparently also an issue in the Auckland and Waikato regions. It is suspected that a lack of education, and hence ignorance, of the rules and

[1] http://www.stuff.co.nz/nelson-mail/news/3705485/Log-avalanche-as-flood-hits. Nelson Mail. Log avalanche as flood hits. Visited 11 Apr 2012.

[2] http://www.stuff.co.nz/national/6141806/Slips-causing-major-problems-in-Nelson. Nelson Mail. Slips causing major problems in Nelson. Visited 11 Apr 2012.

[3] http://www.nzfoa.org.nz/news/forestry-news/533-190310aforestrynews. NZ Forest Owners Assoc. Forestry company fined for RMA offences. Visited 13 Sept 2012.

environmental effects is a major reason that non-compliance is so high in 'permitted' activities[4].

The adverse environmental effects which can occur if forest operations are poorly managed can have some serious consequences. Sedimentation and slash deposition can affect the environment in the immediate area and downstream. It can also affect people by damaging downstream properties and infrastructure. In turn, by causing these effects, the industry can incur public criticism, prosecution and fines. There are tools available which can be used to avoid these effects. One of these tools is forest codes of practice for erosion and sediment control.

2.2 Codes of Practice

2.2.1 What is a 'code of practice'?

A code of practice can be defined as "a body of rules for practical guidance only, or that sets out professional standards of behaviour, but does not have the force of law" (Law & Martin, 2009). There are several codes of practice which pertain to forestry operations; however, codes of practice exist for many other applications. In New Zealand, codes of practice are issued by the government. For example, the Ministry of Education has a Code of Practice for the Pastoral Care of International Students[5], the Ministry for Economic Development has several Electrical Codes of Practice[6], and the Privacy Commissioner has approved several codes under the Privacy Act 1993[7]. Organisations or corporations may also issue codes of practice, for example, Fert Research have released a Code of Practice for Nutrient Management[8], and The New Zealand Ice Cream Manufacturers Association has their own code for food safety[9].

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[4] http://www.nrc.govt.nz/News-Archive/2011/Foresters-urged-to-lift-game-on-sediment/. Northland Regional Council. Foresters urged to lift game on sediment. Visited 13 Sept 2012.

[5] http://www.minedu.govt.nz/NZEducation/EducationPolicies/InternationalEducation/ForProvidersOfInternationalEducation/CodeofPracticeforInternationalStudents/CodeOfPractice.aspx. Ministry of Education. The Code of Practice. Visited 16 Nov 2011.

[6] http://www.energysafety.govt.nz/templates/StandardSummary 18586.aspx. Ministry of Economic Development. Visited 16 Nov 2011.

[7] http://privacy.org.nz/codes-of-practice/. Privacy Commissioner. Visited 16 Nov 2011.

[8] http://www.fertresearch.org.nz/code-of-practice. Fert Research. Visited 16 Nov 2011.

[9] http://www.nzicecream.org.nz/code.htm. NZ Ice Cream Manufacturers Association. Interim Code of Practice. Visited 16 Nov 2011.

Given that the focus of this review is on forestry, it is worth noting that codes of practice cover several aspects of the industry. The Department of Labour have published a number of approved codes of practice, guidelines and bulletins relating to health and safety in the forestry workplace[10] as recommended means of compliance with the Health and Safety in Employment Act 1992. Members of the New Zealand Institute of Forestry (NZIF) are bound by the NZIF Code of Ethics[11] and are held liable for breaches. The NZ Forest Owners' Association have published two codes of practice; "Eliminating Drugs & Alcohol from the Workplace"[12] and "The NZ Environmental Code of Practice for Plantation Forestry"(NZ Forest Owners Association, 2007). The latter is one of the codes which will be evaluated later in this document.

Codes of forest practice are collections of regulations or guidelines developed to aid foresters in the selection of practices to follow when conducting forest management and utilisation operations (Dykstra & Heinrich, 1996). They are also a form of forest policy used to promote particular environmental values (Adams, 1996). The underpinning theory is that the desired outcome of sustainable forest management can be achieved by conforming to the regulations or guidelines outlined in the code (Dykstra & Heinrich, 1996). However, codes of practice can be affected by parallel regulatory standards which have higher legal standing or deal with planning rather than daily execution of operations (Hawkes, 1999).

2.2.2 Previous Research

Some research has been done previously into the area of forest codes of practice, but none has specifically focussed on New Zealand. Some key documents are:

1) Dykstra & Heinrich's (1996) model forest code of practice, published by the Food and Agriculture Organisation of the United Nations (FAO) to guide nations in developing their own codes.

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[10] http://www.osh.dol.govt.nz/order/catalogue/#fe. Department of Labour. Visited 16 Nov 2011.

[11] http://www.nzif.org.nz/Folder?Action=View%20File&Folder_id=85&File=NZIF%20Code%20of%20Ethics%20%28after%202011%20AGM%29%20%286%20Nov%2011%29.pdf. NZ Institute of Forestry. NZ Institute of Forestry (Inc.) Code of Ethics. Visited 16 Nov 2011.

[12] http://www.nzfoa.org.nz/file-libraries-a-resources/cat_view/27-codes-of-practice/28-drugs-a-alcohol. NZ Forest Owner's Association. Eliminating Drugs & Alcohol from the Workplace. Visited 16 Nov 2011.

2) As part of an inquiry into the forest and timber industry, the Australian Resource Assessment Commission (RAC) conducted an assessment of each state/territory's regulatory framework (RAC, 1991).

3) Several papers on forest codes of practice were presented at the Institute of Foresters of Australia's 18th biennial conference. These papers by Hawkes (1999), Wilkinson (1999) and Williams, et al. (1999) analysed how codes were developed and used to regulate forestry in Australia.

The research outlined above formed the basis of the present review of types of codes of practice, and the methods used for the assessment of codes of practice.

2.2.3 Types of Codes of Practice

The reviewed literature suggests that there are four different types of codes of practice.

1. **Codes of practice based on legislative mandates**

   Failure to comply with the code is discouraged through disincentives, i.e. breaches of the code may result in penalties, such as fines, being imposed (Dykstra & Heinrich, 1996). Detailed recommendations are established in guidelines, accompanied by broad requirements established in legislation (Moore & Bull, 2004).

2. **Codes which serve as voluntary guidelines**

   The intention is to achieve the desired outcome through encouraging the adoption of certain practices, without actually mandating them. Alternative practices which also achieve the desired result would also be deemed acceptable (Dykstra & Heinrich, 1996).

3. **Codes formed as part of legislated forest management plans**

   Legislation outlines general provisions for and mandates the provision of a forest management plan. This plan must contain a code of required practices for that management area. Once a code is adopted in an approved plan, it acquires force of law and must be adhered to (Moore & Bull, 2004).

4. **Certification standards**

   Voluntary compliance with the code's standards; made up of principles, criteria and indicators; is encouraged by offering an incentive. Once a third party confirms compliance, a certificate is awarded which certifies the enterprise or management area as 'well-managed'. Such standards are used by certification schemes such as the Forest Stewardship Council (Moore & Bull, 2004).

In defining the 'type' of a code of practice, there are several aspects to be considered. The reviewed literature identified three main aspects: whether the practices in the code are voluntary or mandated, whether the code specifies detailed prescriptions or general principles, and whether compliance is self-managed, institutionally certified or government regulated. These aspects are explained further below.

Mandated or Voluntary Practices

Mandated or voluntary practices each have advantages and disadvantages. Generally, mandatory practices are more easily administered because the regulatory body need only determine if the practices have been adhered to or not. By comparison, voluntary practices are harder to administer because the regulatory body must determine if the desired outcome has been achieved or not. However, voluntary guidelines are more flexible, and so can readily be adjusted to adapt recommended practices to fit new knowledge or altered conditions (Dykstra & Heinrich, 1996).

The issue of liability should also be considered before deciding if mandated or voluntary practices are the best option. Under voluntary guidelines, there is flexibility for managers to choose an alternative practice. Whether or not the recommended practice is followed, if the manager fails to achieve the desired outcome, then they are liable to incur penalty, be it prosecution or another form of disincentive. By comparison, if, having adhered to legally mandated practices, the manager fails to achieve the desired outcome, then the government is liable because they wrote the legislation (Dykstra & Heinrich, 1996).

Often, a code of forest practice will use a combination of both mandatory and voluntary practices. If particular practices are deemed essential, or if it is very difficult

or impossible to determine if the desired outcomes have been achieved, then those practices can be mandated. The remainder of the code's practices can be recommended under voluntary guidelines (Dykstra & Heinrich, 1996).

Self-management, Institutional Certification or Government Regulation

Government regulation imposes penalties for failure to either follow mandated practices or to achieve the desired outcomes. Self-management focuses on promoting good practices through training, education and co-operation (Wilkinson, 1999). There are also certification schemes run by independent institutions, such as the Forest Stewardship Council (FSC)[13], the Programme for the Endorsement of Forest Certification (PEFC)[14] and the International Organisation for Standardisation (ISO)[15].

Whether government regulation or self-management is used will stem from the choice between mandated or voluntary practices. Mandated practices will require government regulation, because the discouragement of poor outcomes through the use of disincentives will only be effective if those disincentives are applied (Hawkes, 1999; Wilkinson, 1999). When a code is government regulated, the resulting system is costly for both the government and the industry. Under self-management, the government incurs less cost overall, and so can afford to focus on key areas; and industry has greater flexibility and independence to improve environmental performance. Under government regulation, the industry tends to achieve only the minimum standards necessary to avoid penalty; whereas under self-management regimes, a trend of "pursuit of excellence" comes to the fore (Wilkinson, 1999).

The socio-economic environment should also be considered before deciding on relative levels of self-management and government regulation. Self-management has the potential to be successful if it has the support of all stakeholders and the workforce is well-trained, well-resourced and motivated (Wilkinson, 1999). However, government regulation and enforcement is also a growing trend as the public demand greater accountability from forest managers (Eddins & Flick, 1997). Wilkinson (1999)

[13] http://www.fsc.org/certification.4.htm. Forest Stewardship Council. Visited 28 Jul 2012.
[14] http://www.pefc.org/about-pefc/who-we-are. Programme for the Endorsement of Forest Certification. Visited 28 Jul 2012.
[15] http://www.iso.org/iso/home/about.htm. International Organisation for Standardisation. Visited 28 Jul 2012.

suggests that any system should have some level of government regulation to monitor compliance and impose penalties if self-management fails to deliver acceptable outcomes.

There is also the question of how government regulation would be carried out. Will the regulation be conducted by an all-encompassing single agency, or will it be conducted by various units of local governments? A single agency approach ensures standards are applied consistently, whereas a multiple-agency approach can result in the forest ecosystem being split between various agencies that handle individual elements such as soil, water, wildlife and recreation (Wilkinson, 1999). This can lead to increased bureaucracy for forest managers to deal with (Eddins & Flick, 1997), and reduce the government's ability to manage the full range of forest values as a whole (Ellefson, Cheng, & Moulton, 1997). Further, conflict between regulations can make it difficult to comply with standards. For example, Hawkes (1999) notes that some prescriptions for road drainage, which were intended to minimise erosion, had negative impacts on vehicle safety.

Prescriptive Codes or Outcome Based Codes

Prescriptive codes are audited by checking if the prescriptions have been adhered to, whereas outcome based codes are audited by checking if the desired outcome has been achieved or not (Williams, et al., 1999). A prescription is mandatory and will be very detailed (e.g. "No harvesting is to occur within 15m of any waterway"), whilst outcome based codes will be made up of guidelines which are more flexible (e.g. "Consider the benefits of wider riparian setbacks") (Wilkinson, 1999). Generally, outcome based codes are impractical to audit. For example, consider a code intended to prevent unacceptable impacts on soil and water values by forestry through measuring levels of sedimentation in waterways. In practice, using the outcome as a measure of impact would require measuring the 'natural' sediment load patterns for comparison, and the actual monitoring is costly, labour-intensive and long-term (Williams, et al., 1999).

Williams, et al. (1999) propose that prescription auditing and compliance is easier for both auditor and operator, because both know exactly what is permitted and

prohibited. Under an outcome based code, both parties will need to determine which practices will achieve the desired outcome. Consider the sedimentation example: under an outcomes based code, the operator will need to make a judgement as to whether or not the operation will produce sedimentation in excess of the acceptable levels. Under a prescriptive code, they need only observe the prescription to ensure compliance. The risk of not achieving environmentally satisfactory outcomes is transferred from the operator and forest manager to the regulatory body that approved the code of practice (Williams, et al., 1999). However, Dykstra & Heinrich (1996) state that overly prescriptive codes can stifle initiative and make it hard for operators to adapt to changing conditions.

2.3 Discussion & Conclusions

There is potential for adverse environmental effects to arise from poorly planned and/or managed forestry operations. The ramifications of those environmental effects for the forest industry are sobering; the industry would prefer to avoid negative press and/or prosecution over those adverse effects. There is a need for codes of practice for forest managers to refer to as they plan and manage earthworks operations. The literature has shown that there are many different types of codes, each with their own advantages and disadvantages. It has been recommended that a national forest code of practice for erosion and sediment control should be introduced (Bloomberg, et al., 2011), but what type of code should be used?

Before looking at a potential future national code of practice for erosion and sediment control, it is worthwhile to consider the existing codes of practice. Several different types of codes of practice are already in use in New Zealand: voluntary and mandatory, self-managed and government-regulated, and prescriptive and outcome-based. Although there has been research on different types of codes, the codes used in New Zealand forestry have not been looked at specifically. This gap in existing research needs to be addressed. By analysing the existing codes of practice, the strengths and weaknesses of those codes can be identified and then adopted or avoided respectively when developing a national code.

The literature on types of codes of practice also outlines some of the conditions under which the codes may be successfully implemented and the potential merits and drawbacks of these conditions have been described. The literature indicates that addressing these conditions are important for a code to succeed, but does not explicitly state which combination of type of code and conditions is best. In addition to identifying what type of code should be adopted as a national code of practice, the conditions under which this code should be introduced must also be identified. These conditions can be classified into two groups: 'internal' and 'external' conditions. Internal conditions are those which can be assessed looking only at the code of practice as a document, i.e. those which are written in the code. External conditions are those other factors which influence the success of a code of practice, but are not necessarily included within the written code. These factors include the broader legal, social and economic context within which the code of practice exists.

2.4 Research Questions

Based on the reviewed literature and the issues outlined above, the following research questions will be addressed in this dissertation.

1. Under what conditions is a code of practice more likely to succeed in protecting the environment? What are the broader legal and social conditions, i.e. 'external conditions', under which a code will be more successful? What are the strict criteria that a code should meet, i.e. 'internal conditions', to be successful?
2. As part of the overall RMA policy and legislative framework, what are the strengths and weaknesses of New Zealand's existing forest codes of practice for erosion and sediment control?
3. If a national forest code of practice for erosion and sediment control was to be adopted, what type of code should be used, and under what conditions?

3 Development of criteria for classification and assessment of codes of practice

In order to answer the first research question on the conditions required for a code to be successful, those conditions have to be identified. Those conditions were used to form a set of criteria, which were used to answer the second research question on the strengths and weaknesses of the existing codes of practice and the third question on what type a national code of practice should be.

3.1 External Conditions

3.1.1 Motivation and Agency

Not all differences in external conditions will make a code of practice more or less successful. As has already been outlined in the literature review, there are many different types of codes and they can be implemented in various ways. It is useful to be able to classify codes, as not all external conditions will apply to every type of code. For example, non-compliance with an institutions' voluntary code of practice may not be associated with prosecution by government agencies.

Based upon synthesis of the reviewed literature, a model to explain why a forest management corporation would adopt a forest code of practice for erosion and sediment control is proposed. The Motivation & Agency Model (MAM) can be used to describe and compare the conditions under which codes of practice are adopted, and the agencies which develop and implement them. This will help to identify which conditions apply to the existing codes of practice and also which should be applied to a future national code.

Agency

There are three types of agencies which can develop a code of practice and require compliance by a corporation. These agency types are government, other institutions, and the corporation itself. The effects of these agencies are not mutually exclusive, several agencies can affect compliance at once (Figure 4). For example, a code of practice may be developed by an outside institution, but the implementation of the code and monitoring of environmental effects may be left to the corporation. Or, an

institution-developed code may be mandated by the government, by including compliance with the code as a condition in resource consents.

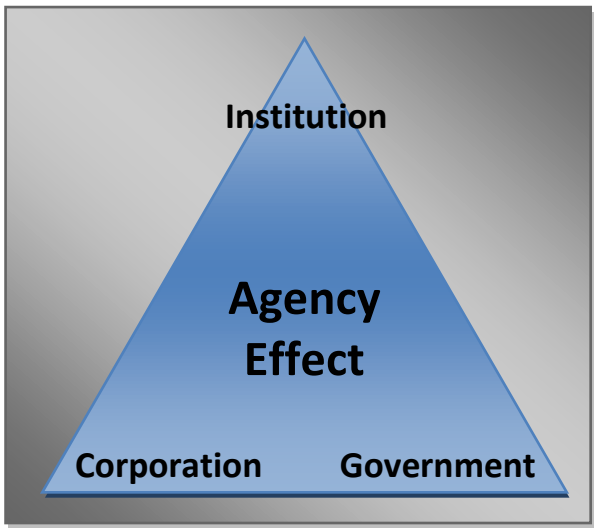


Figure 4: Effect of agencies which can develop and require compliance with codes of practice (See Explanatory Note, pg 15).

Motivation

Once a code of practice has been published, there are three reasons, or motivations, for a corporation to adopt it. Compliance with a code of practice can be mandated, such as under the RMA. A corporation may choose to adopt a code for financial reasons, such as avoiding fines or to gain subsidies or better market access. Or, a corporation may choose to adopt a code simply for the sake of altruism, or to create the perception that it is altruistic.

Again, these motivations are not mutually exclusive; more than one can apply at once (*Figure 5*). For example, when compliance with a code of practice is mandated in resource consents, a corporation complies not only because the law says it must, but also because failure to do so can lead to fines and bad publicity, both of which have a financial effect. A corporation may volunteer to comply with a code of practice not only to gain financial reward, but also out of a sense of responsibility to society or to its industry, or to create the perception of altruism.

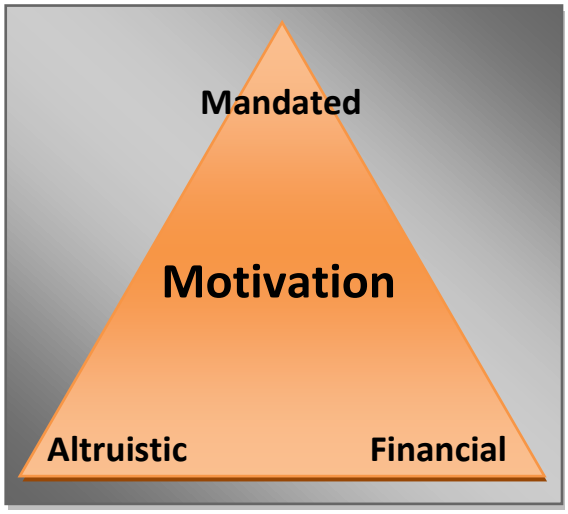


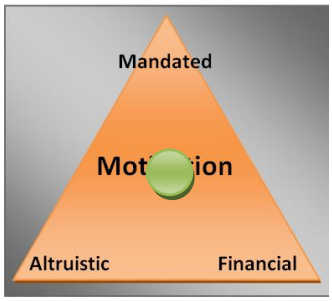
Figure 5: Motivations for a corporation to adopt a code of practice. (See Explanatory Note below).

Explanatory Note for Agency Effect and Motivation diagrams

The effect of an agency/ motivation can be exclusive (i.e. one vertex of the triangle), or it can be a combination of two or three agencies/motivations. The contribution of each agency effect/motivation is a continuum ranging from 0 – 100 percent, and the sum of all three must equal 100 percent. Consider the examples below.

Motivation
Mandated: 100%
Altruistic: 0%
Financial: 0%

Motivation
Mandated: 0%
Altruistic: 50%
Financial: 50%



Motivation
Mandated: 33%
Altruistic: 33%
Financial: 33%

Not all combinations of motivations and agencies under the MAM are possible. The potential combinations are outlined and explained overleaf (Table 1).

Table 1: Possible basic combinations of agency effect and motivation

Agency	Motivation	Possible	Explanation
Government	Mandated	✓	Codes of practice published by local governments are mandated in resource consents issued under the RMA.
	Financial	✓	Governments can provide financial incentives, in the form of subsidies, grants or fines, for compliance or non-compliance with codes of practice.
	Altruistic	×	A government-issued code of practice would be part of a larger system such as those mentioned above. A government would not issue a code of practice in hope that a corporation would adopt it out of altruism.
Institution	Mandated	×	Although an institution could mandate that members must follow a code of practice, a corporation's decision to be a member of that institution remains voluntary. Hence, unlike government-mandated codes, an institution's code cannot be forced upon corporations.
	Financial	✓	If an institution offers certification, compliance with codes of practice can provide market access.
	Altruistic	✓	Example: The existing Environmental Code of Practice for Plantation Forestry is not an enforced code of practice and offers no financial incentives. A corporation which chooses to follow this code does so out of a sense of social responsibility.
Corporation	Mandated	✓	Governments could mandate that corporations produce their own code of practice, which the government could approve and then expect a corporation to abide by.
	Financial	✓	A corporation may produce and abide by a code of practice to show outside institutions that they are environmentally responsible in a bid to gain certification, and in turn, market access.
	Altruistic	✓	Corporations may produce a code of practice purely because they want to, or feel obliged to, out of a sense of corporate social responsibility.

3.1.2 Case Studies from the International Primary Sector

In New Zealand, the reduction, mitigation and avoidance of adverse environmental effects is legislated by the RMA and by issuing of resource consents under that Act. Although this study is focussed on the New Zealand forestry industry, it is worth noting that other systems for managing environmental effects exist in other countries and primary industries. Three case studies were analysed. Two focussed on agriculture and one on forestry; in England, Greece and West Virginia, USA respectively.

Agriculture – England

A case study was carried out by Posthumus, et al. (2011) to understand how current legislation and policies affected soil degradation prevention in England. There are two kinds of legislation and policies which address soil degradation: mandatory and voluntary.

Two pieces of legislation relate to soil degradation. The Highways Act 1980 enables the Environment Agency to sue farmers for causing preventable muddy floods on a road. The Water Resources Act 1991 stipulates that causing poisonous/noxious/toxic material or solid waste to enter a waterway, whether deliberately or by accident, is illegal. The latter, however, is not considered to be effectively enforced because the very nature of erosion makes it difficult to prove liability. Further, some breaches could be argued to have been caused by extreme, out-of-season weather events (Posthumus, et al., 2011).

The two mandatory policy instruments to prevent soil degradation are Statutory Management Requirements (SMR) and Good Agricultural and Environmental Conditions (GAEC). Farmers are financially rewarded for complying with the standards, and failure to comply results in the reduction or loss of payments. The GAEC requires farmers to produce Soil Protection Reviews (SPR) to identify and address soil management issues, but farm advisors indicated that SPR are not effective because they only raise awareness of issues, without obliging farmers to address them because monitoring is minimal. Farmers also disliked the SPR because of the extra paperwork they required (Posthumus, et al., 2011).

The Environmental Stewardship Scheme (ESS) is a voluntary, incentivised, three-tier programme. Farmers produce Farm Environmental Records (FER), which identify paddocks with high erosion and/or runoff risks. The lowest level of the scheme allows farmers to choose which prescriptions to adhere to, so there is a tendency to choose those which are least demanding or highest paying. The higher levels of the scheme are more restrictive and require more administration work, but the difference in financial incentive is not high enough to encourage farmers to subscribe to a higher level (Posthumus, et al., 2011).

The relationship between the enforcement agency and farmers is also important. Farmers reported that they preferred if a friendlier approach was used, such as officers working with farmers to identify and rectify potential breaches, rather than sending letters threatening prosecution. However, farm advisors felt that this approach also led farmers to not fear prosecution, leading them to take more risks to achieve greater profits (Posthumus, et al., 2011).

For soil conservation to be successful, agencies need to engage farmers. To do this, they must understand why farmers do or do not participate in schemes. Posthumus, et al. (2011) found the main reason that farmers participated was for the financial rewards. The main reasons they did not were because they felt it restricted their management options and flexibility to react to markets. Generally, farmers were concerned about soil degradation if it reduced productivity, led to prosecution, or caused a loss of grant payments (Posthumus, et al., 2011).

Agriculture – Greece

A case study by Barbayiannis, et al. (2011) analysed how policy influenced soil conservation in Greek agriculture. The major policy instrument in Greek agriculture is the European Union's Common Agricultural Policy (CAP), of which the incentivised GAEC is a part.

There are three institutions which influence farm management decisions, and hence, soil conservation. These are the state, through national, regional and local agencies; farming co-operatives; and environmental non-governmental organisations (ENGOs). The ENGOs have criticised the implementation of CAP, because there was no genuine

public consultation stage and it is not well-coordinated. In interviews, government and non-government officials indicated that the establishment of new institutional structures has been delayed because of conflict within and between the various institutions. These delays had been caused by conflicting government policies managed by different ministries, a lack of clear management plans for some organisations and understaffing. Poor decision-making in directing funding for preparation of long-term infrastructure was also a problem. For example, a lack of modern GIS tools meant there was no detailed and coherent soil map, which impeded soil management on a national scale (Barbayiannis, et al., 2011).

Inconsistency between agricultural policies and other policies confused farmers and led them to lose trust in the government. For example, one policy offered subsidies for the purchase of heavy machinery, whilst another dictated that the use of heavy machinery should be avoided to reduce soil erosion and compaction (Barbayiannis, et al., 2011).

Forestry – West Virginia, USA

In West Virginia, concern over sediment from forestry operations led to the introduction of the Logging Sediment Control Act 1992 (LSCA). Wang, et al. (2004) reviewed this legislation, the five reforms of best management practices (BMP), and how they are implemented.

Each logging job must be supervised by a certified logger. To gain certification, one must successfully complete training in first aid, health and safety, and BMP. Under the LSCA, the foresters of the West Virginia Division of Forestry (WVDoF) are responsible for enforcing BMP. As such, they are able to issue loggers with compliance orders if there is a potential for soil erosion and/or water pollution. Breaches can also result in suspension orders, and it is estimated that the average crew would lose at least US$4000 per day suspended. Recent changes to the LSCA have given WVDoF foresters the power to issue criminal citations and fines of between $250 and $500, per day, per violation (Wang, et al., 2004).

The LSCA appears to be effective. Since 1992, compliance with the LSCA has shown an upward annual trend, with a ten percent increase in compliance over the period

1998 to 2001. It has been speculated that the introduction of misdemeanour fines, and continuing education programs for loggers, will further increase compliance (Wang, et al., 2004).

BMP are not stagnant, they are flexible and can be changed as needed. The BMP pre-date the LSCA by twenty years. A committee reviews the BMP every three years, or sooner if required. The BMP have been revised five times since 1972 (Wang, et al., 2004).

Lessons from International Case Studies

The case of England's SPR illustrates that raising awareness of environmental issues is a positive thing, but is not necessarily useful if land managers are not obliged to act. The SPR could be considered a poorly implemented regulatory system, because it is disliked by the land managers and is seen as ineffective by the enforcers. This highlights two issues which should be kept in mind; a system should be designed so that the land managers see it as a useful tool rather than an obstacle, and adequate monitoring needs to be carried out to actually enforce the system. In the case of the SRP, the system was disliked because of the excessive paperwork, so it is important that a code of practice should require minimal bureaucracy and 'paper pushing'.

The situation in England has also shown that it is difficult to prove liability for erosion. The Water Resources Act 1991 is outcome-based, and is not dissimilar to New Zealand legislation. Given the difficulty that England has had proving liability of and prosecuting farmers for erosion and sedimentation, it calls into question if outcomes-based legislation is the best way to prevent these adverse environmental effects. It would make more sense to assess the actions of land managers rather than assess outcomes which may be beyond their control if there is an extreme weather event.

The English case study shows that for a code to be successful there needs to be a good working relationship between land managers and the authorities. A friendly approach is less likely to be met with resistance than a threatening approach. However, it is also important that the land managers respect the authorities and do not dismiss their advice. This friendly relationship is achievable, as illustrated by the Northland Regional Council. The council offers training on sediment controls and invites land managers to

ask for advice, because it prefers to educate land managers rather than prosecute them. At the same time, the council makes no secret that it is prepared to, and does, prosecute offenders[16]. Although this relationship cannot be stipulated in a code, it is a condition required to make a code successful, and so should be kept in mind when implementing a code of practice.

Another key lesson to come from the English case study is that the primary motivation for farmers to participate in schemes is financial. Given that forestry is also a business, it is fair to assume that foresters are driven by a similar motivation. A regulatory system needs to have sufficient incentives or disincentives to encourage or discourage certain practices. Putting aside the idea of offering subsidies for good practice, this means that fines issued under the RMA need to be sufficient to discourage forest managers from taking risks. For this to be effective, however, the evidence used to justify prosecution needs to be robust. Given the difficulty that English authorities have had proving liability for sedimentation and erosion it may prove difficult to actually fine corporations in New Zealand too, thus neutralising the threat of fines.

The Greek case study highlighted the importance of cooperation between all the agencies involved in development to avoid delays in establishing a new institutional structure. At present, the PNESPF is at the fourth of the six steps required before implementation. Unlike the Greek implementation of CAP, the process has included consultation with the public and involved parties. The PNESPF still requires the approval of Cabinet following the redesign currently underway[17]. Following, or perhaps accompanying, the approval of the PNESPF a national code of practice may be introduced. This process of approving the PNESPF and associated code has the potential to take a long time, and so it is important that the industry and the government endeavour to minimise delays and make sound decisions around the establishment of long-term infrastructures.

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[16] http://www.nrc.govt.nz/News-Archive/2011/Foresters-urged-to-lift-game-on-sediment/. Northland Regional Council. Foresters urged to lift game on sediment. Visited 13 Sept 2012.

[17] http://www.mfe.govt.nz/laws/standards/forestry/index.html#process. Ministry for the Environment. Process – where we are at. Visited 17 Sept 2012.

Another issue highlighted by the Greek case study was that consistency between policies is vital to the success of a regulatory system. In the same vein, if a code recommends practices which conflict with other rules, the faith that managers and contractors have in that code will be lessened. The effect of inconsistency between codes was observed during a recent field study by the author; a contractor was disillusioned by the rules in the regional council's code of practice because he felt that the prescriptions for a sediment control posed a health and safety risk to traffic. As such, he did not build the sediment controls to prescription, as he felt that health and safety took precedence. This inconsistency could have been avoided through consultation between contractors, the regional authority and the Department of Labour. Considering the example of the proposed national forest code of practice which may be published by the Ministry for the Environment, then it should be written in consultation not only with managers, contractors and the public, but also other government departments such as the Department of Labour, the Department of Conservation and the Ministry for Primary Industries to ensure consistency between policies.

The West Virginian case study presents some alternative options to ensure compliance. The idea of formally training and licensing operators may be worth consideration, but would require long-term planning first. Licensing operators could be included as a resource consent condition to ensure that all operators have been trained in the national code of practice. This could potentially be an effective way to facilitate the transition from regional standards to a national standard.

If a code of practice is introduced, then the progress made can be measured by ensuring the code is monitored. This would help to both check that the new code is effective and also to note if revisions of the code make a difference to performance. One way of achieving this would be to record statistics on compliance, in a similar manner to the WVDoF, both before the introduction of and during the use of the code to allow comparison.

3.2 Internal Conditions

3.2.1 Assessment Criteria

The assessment of codes of practice draws on various criteria which should be present in a code of practice. These components are the 'internal conditions' that influence the success of a code. The eight components are outlined below by section.

Objective

Codes of practice should include a "well-defined and clearly stated" aim or purpose (RAC, 1991).

Regulatory Approach

The RAC (1991) recommends that a code should apply to all land tenure types: State forest, Crown land, freehold land and leasehold land. Further, the code should set a minimum standard for states, and additional standards can be added for certain areas (RAC, 1991). This refers to the Australian system of state and territorial governments, but "states" can be translated to Regional Councils to fit the New Zealand context.

Hawkes (1999) suggests that codes should be enforceable by regulation. The RAC (1991) state that this should be done vigorously, and that penalties should be substantial. The penalties should be outlined, as well as provisions for appeal (Dykstra & Heinrich, 1996). Hawkes (1999) recommends that the accountability of parties should also be outlined. Plans should be prepared for forestry operations, and these should be submitted to a formal approval and monitoring process (RAC, 1991). See Section 2.2.3 for more information on Self-Management and Government Regulation.

Planning

Codes of practice should aid forest managers in the selection of operational practices. They should describe the potential impacts of poor practices, and detail recommended practices (Dykstra & Heinrich, 1996). This applies equally to all codes, irrespective of their type under the MAM, as the purpose of a code of practice is to provide guidelines for managers.

Comprehensiveness

The RAC (1991) states that codes should be comprehensive, and lists a number of aspects for which codes of practice should set standards, at a minimum. Two of the aspects on this list relate to earthworks:

- "…soil erosion, slope restrictions and erosion mitigation requirements;
- roading, snigging tracks [skid trails] and log landings, their placement, construction, width, drainage and treatment post-harvesting…".

These two aspects will be included in the classification system used to assess the strengths and weaknesses of forest codes of practice.

Monitoring

The type of monitoring to be carried out and the manner in which the results will be reported should be detailed in a code (RAC, 1991). Regardless of whether a code is prescription or outcome-based, compliance with the defined prescriptions or outcomes needs to be monitored. If monitoring is not carried out, then the code cannot be enforced by the agency.

Foundation

A code of practice should be based around policy (Hawkes, 1999). The rules in a code should be guided by the policies of the agency - be it a government, corporation or other institution.

Adams (1996) states that in order for a code of practice to be successful, it must have a solid foundation of research. Again, this applies in all cases. Before setting standards in a code of practice, an agency should justify those standards with evidence that following the standards will achieve the objectives of the code. Without this evidence, the validity of the code can easily be called into question.

The preparation of a code should involve appropriate stakeholders (Hawkes, 1999), so the endorsement of the stakeholders listed in Dykstra & Heinrich (1996) has been included in the assessment criteria. These stakeholders are: government forestry officials, forest industry representatives, loggers, the local community,

non-governmental organisations (NGOs), and technical experts from research institutes or universities (Dykstra & Heinrich, 1996).

Dykstra & Heinrich (1996) state that relevant legislation should be listed in the references for the code. Both Hawkes (1999) and the RAC (1991) state that the relationship between the code and legislation should be clear. This does not apply only to those government-published codes which have a direct relationship with legislation, as an institution's or corporation's code of practice may also aim to achieve compliance with the law.

Communication

Hawkes (1999) states that a code of practice must be understood. The wording must be clear, and the language style should be appropriate for the intended audience. This applies equally to all types of code, irrespective of their classification.

Review Process

Codes of practice should be subjected to regular review, and scrutiny and discussion of codes should be encouraged (RAC, 1991), to keep them up-to-date with progress in understanding, technology and priorities. A good code of practice should be flexible enough to be amended as new information becomes available (Dykstra & Heinrich, 1996) and any amendments should be made in consultation with stakeholders (Hawkes, 1999).

This applies equally to all types of code. Government codes will need to be reviewed as legislation and public opinion – and so, government policy – changes. Institutional codes will need to be reviewed as the objectives of the institution change, and likewise for corporations. Assuming a code is based on sound research, its prescribed practices or outcomes may also need to be reviewed as new research becomes available.

4 Assessment and Classification of Codes of Practice

In order to address the second research question on the strengths and weaknesses of the existing codes of practice used in New Zealand, those codes were assessed by their external and internal conditions as outlined in Section 3.

4.1 Methods

The assessment of the reviewed codes of practice for erosion and sediment control was carried out in two phases; a classification by type, motivation and agency, and an assessment of which internal conditions were met.

4.1.1 Assessing the external conditions that affect a code of practice

Each of the six reviewed codes of practice were classified by their motivation and agency as described under the MAM in Section 3.1.1, and by their type, as described in the literature review in Section 2.2.3.

The external conditions which affect the success of a code (Table 2) were identified in the international case studies in Section 3.1.2. A future study should build upon this list and identify any other external conditions. The external conditions which can affect a code's success have not been included in this assessment. To carry out such an assessment would, at least, require interviewing forest managers and council officers, a review of policies across various government agencies, and analysis of monitoring systems. This would be a significant undertaking and is beyond the scope of this study.

Table 2: External conditions required for a code of practice or wider regulatory system to be successful, as identified in the international case studies of primary industries.

Development of regulatory system / code of practice	Co-operation between all parties involved in the development of the system
	Policies between different agencies are consistent
	Policies are consistent between different systems
	Progress made is measured by ensuring the system is monitored
Role of the agency	The agency raises awareness of environmental issues
	The agency conducts adequate monitoring to enable enforcement
	The agency's monitoring methods are sufficient to prove liability
	The regulatory system is well-implemented
	The agency offers training to enable compliance by managers
	The agency prosecutes offenders (if applicable)
Perceptions and Influence of regulatory system	There is a good working relationship between managers and the agency
	The regulatory system is perceived by managers as a useful tool, rather than an obstacle
	The system requires minimal paperwork
	(Dis)incentives are sufficient to encourage/discourage certain practices

4.1.2 Assessing the internal conditions that affect a code's success

The internal conditions that affect the success of a code of practice were identified in Section 3.2.1, and have been used to develop a set of formal assessment criteria used to assess the strengths and weaknesses of the codes of practice.

By calculating the percentage of applicable criteria that had been met, each of the eight sections was scored out of one hundred; allowing the codes to be compared on a like-for-like basis. The assessment criteria consist of eight sections, as previously outlined in Section 3.2.1. The internal conditions listed in these eight sections have all been found to be vital in the literature for a code of practice to succeed. The codes' internal conditions were assessed by noting if a code had met the individual criteria or not. Some criteria which were not applicable to a certain code were marked as

'not applicable'; for example, the Unsealed Roads Manual (Giumarra, 2009) was not assessed against forestry-specific conditions because it is not a forestry document. A full breakdown of the assessment of internal conditions, with the results for each criterion, can be found in Appendix 1.

The assessment of some of these criteria is preliminary, rather than definitive. Although much of the assessment was based on presence or absence of content from the code of practice, in some cases a judgement had to be made based on the available evidence. For example, "Penalties for breaches are outlined" is a yes/no question and simple to assess, whereas "Language is appropriate for intended audience" requires a judgement to be made. This is a limitation of this study. If this study were to be extended, surveying a panel of end-users of the codes would provide a stronger basis to the assessment.

4.2 Assessment Results

4.2.1 Classification of External Conditions

The results show that all of the codes of practice fit into one of two classifications under the MAM and types of codes of practice. Four of the codes can be classified as 'Type 2: Code which serves as a voluntary guideline', and have an institution agency and voluntary motivation under the MAM. The other two codes can be classified as 'Type 1: Code of practice based on legislative mandates', and have a government agency and mandatory motivation under the MAM (Table 3).

Note that the classification of a code of practice does not necessarily indicate the level of success of a code. It can, however, indicate what the ideal external conditions for a code are and allows the identification of potential issues associated with a particular type of code. These issues were outlined in the literature review in Section 2.2.3.

Table 3: Classification of six forest codes of practice for erosion and sediment control used in New Zealand, by agency, motivation and type.

Code of Practice	Agency	Motivation	Type
New Zealand Forest Code of Practice, Second Edition (1993)	Institution, published by the Logging Industry Research Organisation.	Voluntary	2. Code which serves as voluntary guideline.
New Zealand Environmental Code of Practice for Plantation Forestry (2007)	Institution, published by the NZFOA.	Voluntary, although the NZFOA "recommends" that its members adhere to the code.	2. Code which serves as voluntary guideline.
Forestry Operations in the Auckland Region, A Guideline for Erosion and Sediment Control TP223 (2007)	Government; published by the Auckland Regional Council.	Mandated; referenced in resource consents issued under RMA.	1. Codes of practice based on legislative mandates.
Erosion & Sediment Control, Guidelines for Soil Disturbing Activities, Environment Waikato Technical Report No. 2009/02 (2009)	Government; published by the Waikato Regional Council.	Mandated; referenced in resource consents issued under RMA.	1. Codes of practice based on legislative mandates.
Unsealed Roads Manual: Guidelines to Good Practice, Third Edition (2009)	Institution, published by the Australian Road Research Board.	Voluntary	2. Code which serves as voluntary guideline.
New Zealand Forest Road Engineering Manual (2011)	Institution, published by the NZFOA.	Voluntary	2. Code which serves as voluntary guideline.

4.2.2 Assessment of Internal Conditions

Each of the codes of practice was given a score out of one hundred for each section of the assessment. The internal conditions were assessed in eight sections, which were further broken down into several criteria. Each code was assessed against all applicable criteria in each section and the proportion of applicable criteria which had been met was then calculated as a percentage. This gives a score out of one hundred for each of the eight sections for each code of practice (Table 4). Full details of the assessment are in Appendix 1.

Table 4: Assessment scores (out of 100) for the internal conditions of the reviewed New Zealand codes of practice.

	NZ Forest Code of Practice, 2nd ed.	NZ Environmental Code of Practice for Plantation Forestry	Unsealed Roads Manual, 3rd ed.	Auckland Regional Council TP223	Environment Waikato TP No. 2009/02	NZ Forest Roading Manual
Objective	100	100	100	100	100	100
Regulatory Approach	0	40	0	75	75	20
Planning	100	80	100	80	60	60
Comprehensiveness	63	60	67	81	75	82
Monitoring	0	0	33	0	0	66
Foundation	64	64	40	73	45	64
Communication	100	100	100	100	100	100
Review Process	0	0	50	50	0	0

All of the codes have well-defined and clearly-stated objectives (Table 4). The objective helps answer an important, if not the most important, question that forest managers might ask: “Why should we follow this code of practice?”. By setting an objective for a code it is given a purpose, which not only justifies why the code exists, but also provides direction to those writing the code.

Overall, the codes of practice scored well for planning (Table 4). A key weakness in terms of planning was that three of the codes did not describe methods to predict the severity of potential adverse effects (Appendix 1: Table 5).

Another strength of all of the assessed codes of practice is communication (Table 4). All the codes are well-written and the language styles and visual aids used are appropriate for the target audiences. The documents which are intended for use by engineers provide technical detail, whereas those intended for use by forest managers and contractors are less technical and have good visual aids such as photographs and diagrams. In terms of ease of use, visual representations were much easier to follow than large bodies of text. For example, Environment Waikato's code made excellent use of photographs showing good and poor practices to visually reinforce what was said in the text. A national code should draw on these strengths and use visual aids; perhaps even use the best ones from the existing codes.

Overall, the codes did not score well for regulatory approach, although those codes published by regional councils did provide the most information in this area (Table 4). The codes did not provide enough information on penalties and liabilities for breaches of the code and/or the RMA (Appendix 1: Table 5). This is a weakness which needs to be addressed when writing a national code. Those codes which were published by regional authorities did not include this information, whilst the NZFOA's voluntary code included an entire section on penalties and liabilities. This information should be included in a code, even if it can be found in other documentation, because it reinforces why it is important to comply with the code.

None of the codes consistently scored highly for comprehensiveness (Table 4). Roading was the only section to be covered completely by any code of practice, and neither skid trails nor landings were covered completely by any code (Appendix 1: Table 5). These shortcomings in comprehensiveness should be addressed to ensure a code provides all the necessary information for all three of these earthworks construction types.

The foundations of all the codes of practice need improvement, with a range of scores between 40 and 73 (Table 4). The low scores for stakeholder endorsement and/or

involvement in development is concerning, with none scoring above fifty. There are up to six stakeholder groups which should be included in the development process (Section 3.2.1), and at least half of the applicable stakeholders have been excluded during the development of the codes of practice (Appendix 1: Table 5).

The most concerning weakness of the codes is the lack of information on monitoring (Table 4). Four of the six codes fail to describe monitoring methods which can be used by the forest manager and/or are used by the enforcing agency. Only one of the codes describes how monitoring results are reported; in this case, the code provides forest managers with an auditing template. None of the codes define what constitutes an acceptable or unacceptable outcome (Appendix 1: Table 5). These shortcomings are concerning because the RMA is an outcomes-based environmental legislation. To ensure compliance a forest manager should know what outcomes to aim for or avoid, how they or the authorities will monitor those outcomes, and how the results of that monitoring should or will be reported. As such, this weakness must be addressed if a national code was published.

Another weakness of all of the codes of practice was the review process, or lack thereof. Four of the six codes scored zero for this condition. The two which scored fifty were open to and invited public submission. None of the codes state they will be reviewed on a regular basis (Table 4). This means that the codes may not be kept up-to-date with the latest research, innovations, or changes in government policy.

The 'New Zealand Forest Code of Practice' was replaced by the 'New Zealand Environmental Code of Practice for Plantation Forestry' (NZFOA, 2007). However, the assessment of strengths and weaknesses of both codes indicates that the new code has not addressed many of the old code's weaknesses, and in some instances is weaker than the old code (Table 4 and Appendix 1: Table 5).

Although the 'New Zealand Environmental Code of Practice for Plantation Forestry' is a well-written overall forest code of practice (Table 4), it cannot be used as the sole guiding reference for earthworks operations. With only four pages on earthworks operations, it is simply not as comprehensive as the other codes reviewed.

5 Options for a National Code of Practice

The third research questions asks “If a national forest code of practice for erosion and sediment control were to be adopted, what type of code should be used, and under what conditions?”. This section will discuss the options for a type of national code of practice. Note that this is a limited recommendation, as it has only taken account of internal conditions for a successful code, and the external conditions of motivation and agency. The other external conditions (Section 3.1.2), which have been found to be vital to a code of practice’s success, have not yet been assessed. As such, this is only a preliminary recommendation and this area still requires a significant amount of further research before a final recommendation can be made.

It is straightforward to decide motivation and agency for the proposed national code of practice. The agency which will develop and require compliance will be the government, because the proposed code will accompany the Ministry for the Environment’s PNESPF. The motivation to comply with the code should be mandatory, because the code should be referenced in the PNESPF, and also financial, due to the threat of loss of profit from fines and damaged reputation following prosecution.

One could argue that rather than mandating compliance, compliance with the code could be voluntary to give forest managers more flexibility. Whilst this is an option, research suggests that voluntary guidelines are harder to audit (Dykstra & Heinrich, 1996). Keeping in mind that it is already difficult to audit sedimentation and erosion, a voluntary code is not the most practical option.

The proposed national code of practice, if introduced, should be a prescriptive code. The reason that a prescriptive code is better than an outcome-based code is because it is so difficult to measure and prove liability for sedimentation and erosion, particularly after extreme weather events. If a robust and objective method for measuring these adverse environmental effects was developed, and agreed to be reliable by both industry and regulatory authorities, then a voluntary, outcomes-based code could be used. The code will set standards to avoid, remedy or mitigate negative environmental effects. This means that corporations will need to meet the detailed requirements set

out in the code to be deemed compliant. It will also require regulatory authorities to assess operations' erosion and sediment controls.

This recommendation may not seem appealing at first, due to previous experience with prescriptive codes of practice. Some of the existing codes, such as the Auckland Regional Council's TP223, are very prescriptive and include practices that some argue are not practicable for forestry. The industry needs to be involved in the development of the national code, and forest engineering experts should provide input as to which erosion and sediment controls are not suitable for application to forestry earthworks, to prevent the code being overly-prescriptive. A prescriptive national code would require research to set what the best practices actually are.

Compliance with a prescriptive code could be considered as liability insurance. According to Dykstra & Heinrich (1996), if a corporation is fully compliant with a prescriptive code of practice, it cannot be held liable for adverse environmental impacts. Rather, liability is transferred to the government body which set the prescriptions. This is a fairer system than a voluntary outcome-based code, where the forest manager is still liable if the environment is adversely affected, even if they have followed all the guidelines (Dykstra & Heinrich, 1996).

6 Conclusions

The answers to the three research questions, shown below, are summarised in this section.

1. Under what conditions is a code of practice more likely to succeed in protecting the environment? What are the broader legal and social conditions; i.e. 'external conditions'; under which a code will be more successful? What are the strict criteria that a code should meet; i.e. 'internal conditions'; to be successful?
2. As part of the overall RMA policy and legislative framework, what are the strengths and weaknesses of New Zealand's existing forest codes of practice for erosion and sediment control?
3. If a national forest code of practice for erosion and sediment control was to be adopted, what type of code should be used, and under what conditions?

6.1 Conditions for success

The conditions that a code of practice must operate under to be successful can be classified in terms of internal or external conditions.

6.1.1 External conditions

For a code of practice to succeed in protecting the environment, it should be implemented under ideal external conditions. The code should be developed so that land managers consider the code to be a useful tool rather than a bureaucratic obstacle which creates more paperwork. There should be a friendly working relationship between land managers and enforcement authorities, with enforcement authorities offering training and advice on practices. To ensure that the codes of practice are respected and not dismissed, the financial disincentives for non-compliance should be significant enough to influence managers' decision-making.

A code will be more successful if it is developed in consultation with all the affected parties; such as landowners, land managers, contractors and the public. To ensure consistency between policies and to prevent undermining the trust that land managers

place in enforcement authorities, the code should be developed in consultation with other relevant government departments and certification schemes.

6.1.2 Internal conditions

The internal conditions required for a code of practice to succeed refers to the information printed in the code, and so these can be assessed by looking at the code itself. A successful code of practice should have a well-defined and clearly stated objective; include sufficient information on regulatory approach, such as penalties and liabilities; and be a useful tool for planning. It should also have comprehensive information on roading, skid trails and landings; detail monitoring methods, results reporting methods and define acceptable and/or unacceptable outcomes. The code should also have a solid foundation built on policies, references, stakeholder endorsement and legislation. A successful code should communicate ideas effectively, be reviewed regularly and be open to public submissions.

6.2 Strengths and Weaknesses of existing NZ codes

The key strengths across the codes were objectives and communication. All of the six reviewed codes of practice had well-defined and clearly stated objectives. The codes effectively communicated ideas through both written and visual methods, and were appropriate for their target audiences.

The key weakness across the codes was a lack of information on penalties, liabilities, and monitoring. Where non-compliance with a code can lead to penalties, those penalties, and who is liable, should be detailed in the code. As the RMA is an outcomes-based legislation, a code of practice should detail how monitoring is carried out and what is deemed an acceptable or unacceptable outcome.

6.3 Future National Forest Code of Practice

Based on the results of this research, it is recommended that if a national forest code of practice for erosion and sediment control were to be adopted, that code should be a prescriptive code. The agency responsible for the code should be the government and the motivation for compliance should be a combination of mandatory and financial. Note that this is only a preliminary recommendation.

Research should be carried out to develop adequate, but not overzealous, prescriptions. The enforcement of the code, to be fair on the forest industry, would have to assess whether prescriptions had been complied with. If a corporation is deemed compliant, then any adverse effects are beyond the corporation's control and so it cannot be held liable. The other 'conditions for success' outlined in Section 6.1 should also be applied.

7 Further Research Opportunities

This dissertation has explored a topic which has not been looked at before in New Zealand. As such, there is still a lot of research which could be carried out in this area. Some questions which remain to be answered are outlined below.

1. Is the concept of a national forest code of practice actually viable? Or are there actually differences between regions that require regional codes?
2. Are the codes of practice currently used in New Zealand operating under ideal external conditions, including those identified in Section 4.1.1?
3. Are forestry corporations compliant with the codes of practice which apply to them?
4. What are the reasons for the New Zealand forest industry to be compliant or non-compliant with codes of practice, and are these reasons consistent with the external and internal factors identified in this dissertation?

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Appendix 1: Summary of Assessment of NZ Codes of Practice

Table 5: Summary of assessment of six New Zealand forest codes of practice. ✓= 'criteria met', ✘ = 'criteria not met', - = 'not applicable'

			NZ Forest Code of Practice, 2nd ed.	NZ Environmental Code of Practice for Plantation Forestry	Unsealed Roads Manual, 3rd ed.	Auckland Regional Council TP223	Environment Waikato TP No. 2009/02	NZ Forest Roading Manual
Objective		Well-defined and clearly stated objective	✓	✓	✓	✓	✓	✓
Regulatory Approach		Applies to all land tenure types	-	-	-	✓	✓	-
		Minimum standard set for regions	-	-	-	✓	✓	-
		Code is enforceable[18]	✘	✘	✘	✓	✓	✘
		Individuals and groups liable for breaches are identified	✘	✓	✘	✘	✘	✘
		Penalties for breaches are outlined	-	✓	-	✘	✘	✓
		If yes, is an appeals process outlined?	-	✘	-	-	-	✘
	Action Plans	Action plans are required	✘	✘	✘	✓	✓	✘
		Formal approval process	-	-	-	✓	✓	-
		Implementation of plans is monitored	-	-	-	✓	✓	-
Planning		Contains general principles to aid preparation of detailed plans	✓	✓	✓	✓	✘	✓
		Describes methods to predict severity of potential adverse impacts in advance	✓	✓	✓	✘	✘	✘
		Details potential adverse impacts of operations	✓	✓	✓	✓	✓	✘
		Recommends and details methods to avoid/mitigate adverse impacts during operation	✓	✓	✓	✓	✓	✓
		Recommends and details methods to avoid/mitigate adverse impacts after operation	✓	✘	✓	✓	✓	✓

[18] Whether a code is "enforceable" or not is not necessarily a strength or weakness, this only serves to indicate if the code is backed by the regulatory authorities.

			NZ Forest Code of Practice, 2nd ed.	NZ Environmental Code of Practice for Plantation Forestry	Unsealed Roads Manual, 3rd ed.	Auckland Regional Council TP223	Environment Waikato TP No. 2009/02	NZ Forest Roading Manual
Comprehensiveness		Soil erosion, slope restrictions and erosion mitigation requirements	✓	✖	✖	✓	✓	✖
	Minimum requirements set for...							
	Roading	Placement	✓	Only provides information on "earthworks" and does not specify roads, skid trails or landings. Does provide information on placement, construction and drainage, but not on width or post-harvest treatment.	✓	✓	✓	✓
		Construction	✓		✓	✓	✓	✓
		Width	✖		✓	✓	✓	✓
		Drainage	✓		✓	✓	✓	✓
		Post-harvest treatment	✖		✖	✓	✖	✓
	Skid Trails	Placement	✓		-	✓	✓	-
		Construction	✓		-	✓	✖	-
		Width	✓		-	✖	✖	-
		Drainage	✖		-	✖	✓	-
		Post-harvest treatment	✓		-	✓	✓	-
	Landings	Placement	✓		-	✓	✓	✓
		Construction	✓		-	✓	✓	✓
		Dimensions	✖		-	✖	✖	✓
		Drainage	✖		-	✓	✓	✓
		Post-harvest treatment	✖		-	✓	✓	✖
Monitoring		Describes monitoring methods	✖	✖	✓	✖	✖	✓
		Describes how results of monitoring are reported	✖	✖	✖	✖	✖	✓
		Defines what are deemed acceptable and unacceptable outcomes.	✖	✖	✖	✖	✖	✖

			NZ Forest Code of Practice, 2nd ed.	NZ Environmental Code of Practice for Plantation Forestry	Unsealed Roads Manual, 3rd ed.	Auckland Regional Council TP223	Environment Waikato TP No. 2009/02	NZ Forest Roading Manual
Foundation		Code has a policy basis	✗	✗	✗	✓	✓	✗
		Cites reputable references	✓	✓	✓	✓	✓	✓
	Stakeholder Development/Endorsement	Government forestry officials	✓	✗	-	✓	✗	✗
		Forest industry representatives	✓	✓	-	✓	✗	✓
		Loggers	✗	✓	-	✓	✗	✓
		Local community	✗	✗	-	✗	✗	✗
		NGO representatives	✗	✗	✗	✗	✗	✗
		Technical experts from universities and/or research institutes	✓	✓	✓	✗	✗	✓
		References applicable legislation	✓	✓	-	✓	✓	✓
		Relationship between the code and applicable legislation is clear	✓	✓	-	✓	✓	✓
		Is more in-depth information provided in an annex?	✓	✓	✗	✓	✓	✓
Communication		Illustrations are included	✓	✓	✓	✓	✓	✓
		Wording is clear	✓	✓	✓	✓	✓	✓
		Language is appropriate for intended audience	✓	✓	✓	✓	✓	✓
Review Process		Open to public submission	✗	✗	✓	✓	✗	✗
		Reviewed on a stated regular basis	✗	✗	✗	✗	✗	✗